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ZEROING



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What is Zeroing?



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FM 3-22.9 states: “The purpose of battle sight zeroing is to align the sights with the weapon’s barrel given standard issue ammunition. When this is accomplished correctly, the point of aim and the point of impact are the same at a given range....300 meters for the M16A2/M4. This sight setting provides the highest hit probability for most combat targets with minimum adjustment to the aiming point



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What is Zeroing?

The average answer is:

“Adjusting the sights so that the bullets impact where we are aiming.”



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What is Mechanical Zero?



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What is Mechanical Zero?

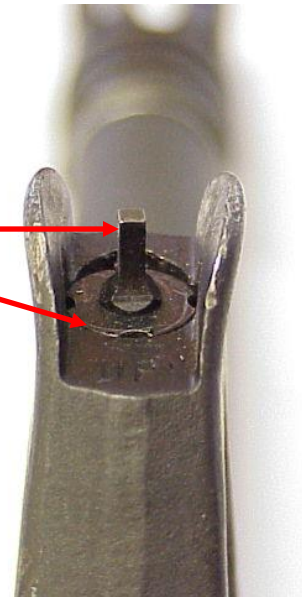
Mechanical zero is simply the mechanically centering of a weapon systems sights.



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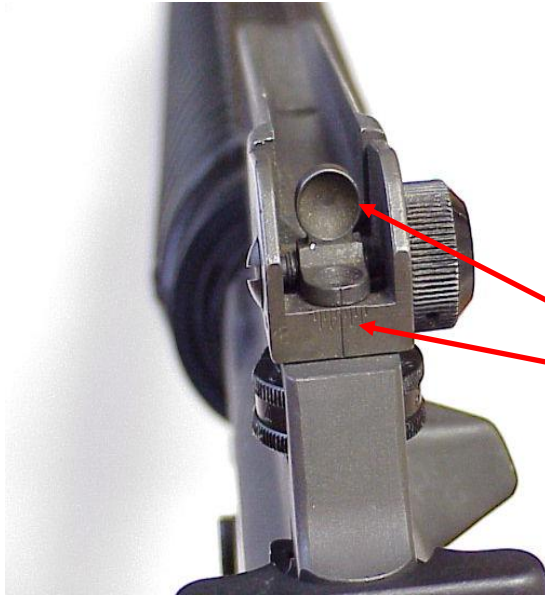


Front sight post is not bent
or damaged. Front sight
post flush with housing.





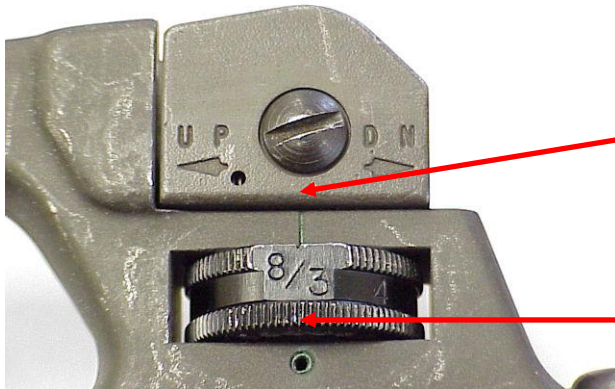
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Small rear sight
aperture is up and
index line is
centered



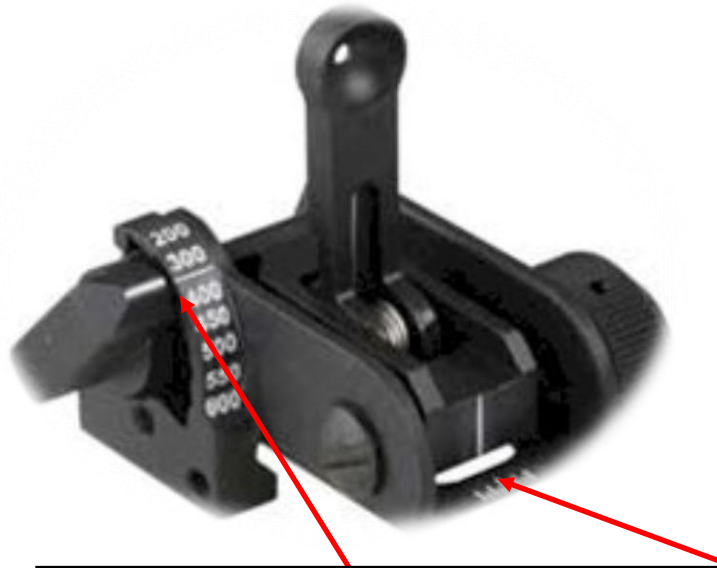
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BDC is bottomed out and
on 300 meter setting.
NOTE: there will be no gap
under the housing when on
300 meter setting



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Armorer mounted in last slot on upper receiver. Windage index line centered. Elevation set on 300



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Zeroing

The Army has developed methods for engaging targets based on the following two scenarios:

1. Unknown distance = Battle Sight Zero (BSZ)

Engaging targets without adjusting for distance

Iron sights, Back-up iron sights (BUIS), M68, EOTEC

2. Known distance = Bullet Drop Compensating (BDC)

Adjusting sights (the 4, 5, and 6 on the iron sights BDC represent 400-600 m) or changing aimpoint (ACOG reticle) for targets at known distances.

Iron sights, BUIS, ACOG, ELCAN, Mark 4 Scope



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Zeroing

To achieve a Battlesight Zero:

1. If available, use bore laser or manually boresight your weapon to get on paper at 25m
2. Zero rifle at 25m
3. **Confirm and/or refine zero at 300 meters**
4. If possible, engage targets from 100m-300m to confirm point of impact versus point of aim

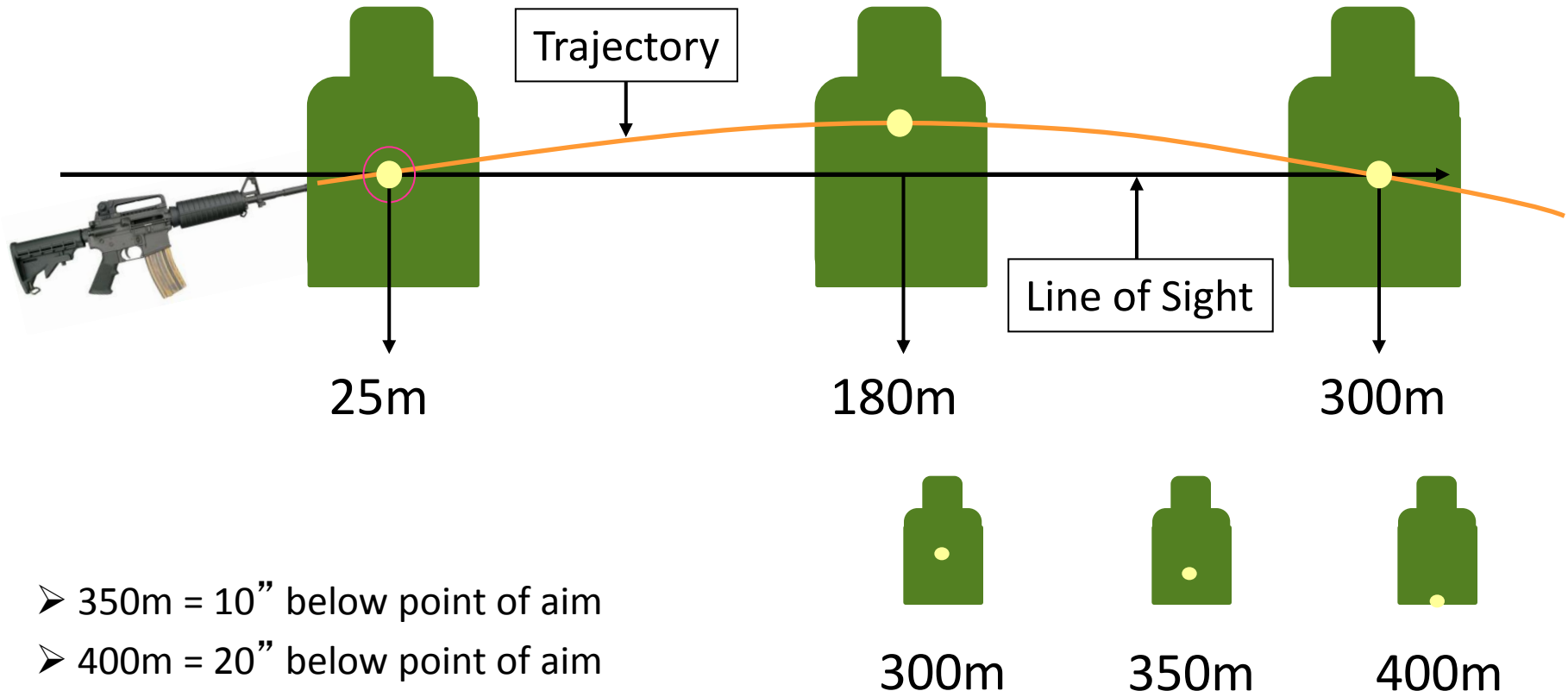


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Battle Sight Zero

- A *Battle Sight Zero* allows you to aim center mass on a target and achieve a hit from zero to 300m. A correctly zeroed rifle will impact within 10 inches of your point of aim.

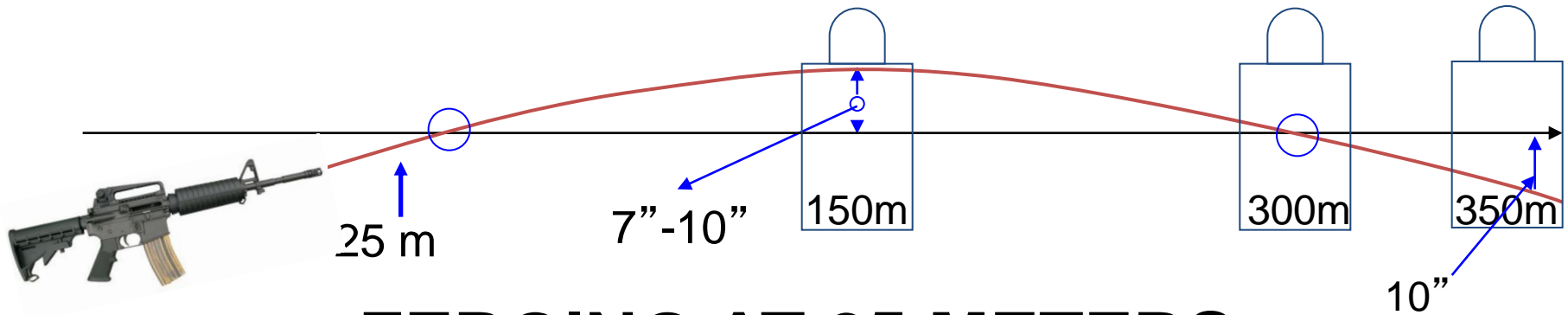




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Representation of M16 Bullet Path



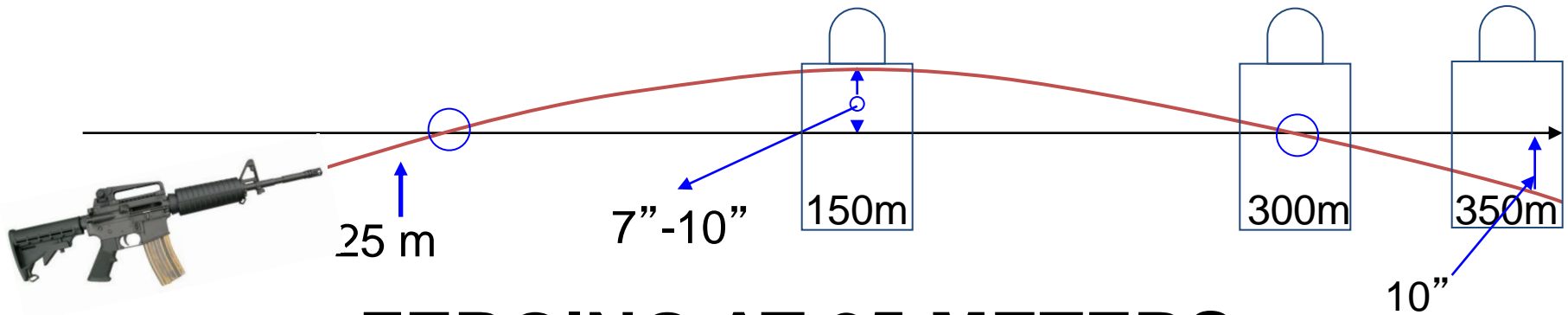
ZEROING AT 25 METERS



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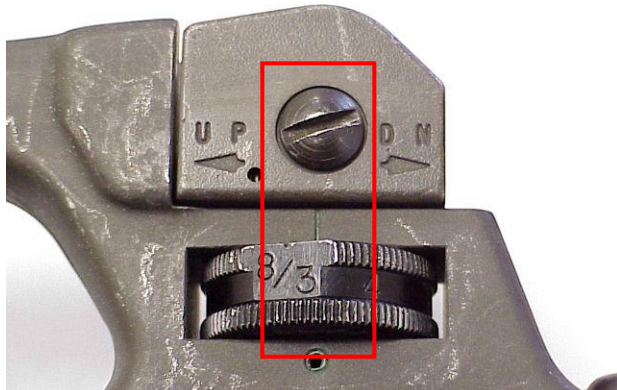


Representation of M16 Bullet Path



ZEROING AT 25 METERS

M16A2/A3
Up 1 click

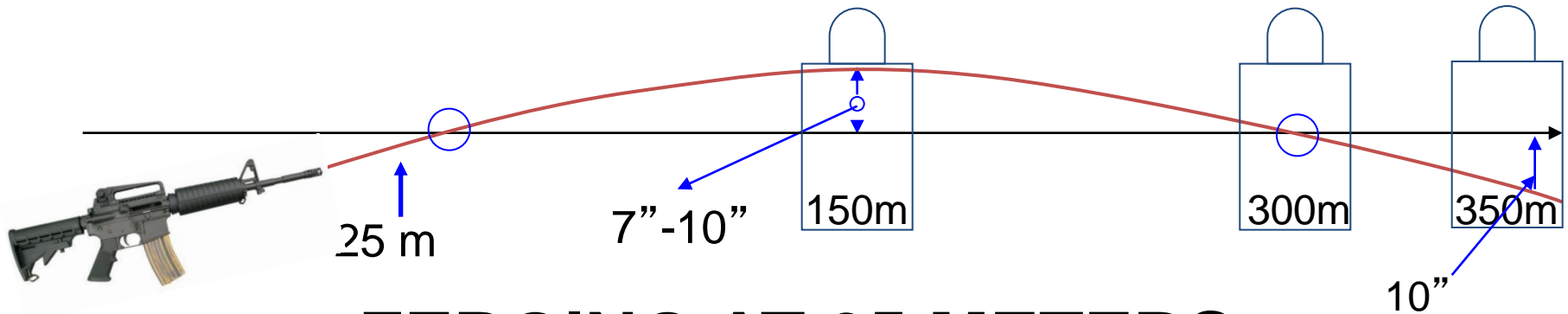




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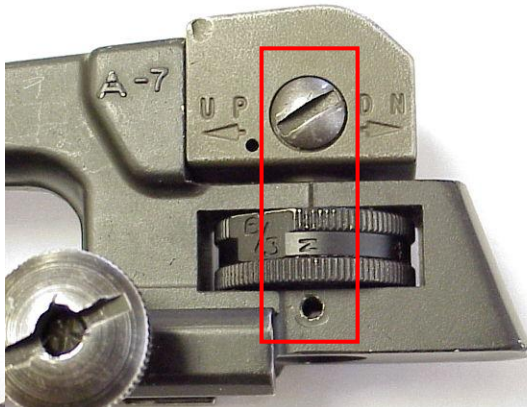
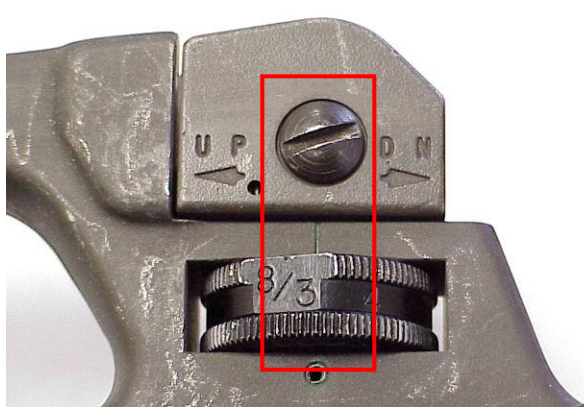
Representation of M16 Bullet Path



ZEROING AT 25 METERS

M16A2/A3
Up 1 click

M16A4
Up 2 clicks to Z setting

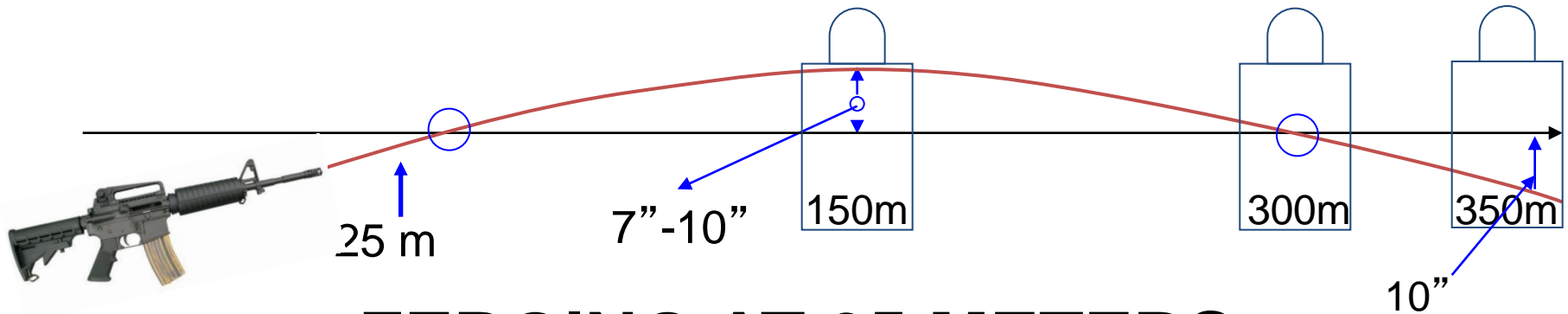




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Representation of M16 Bullet Path

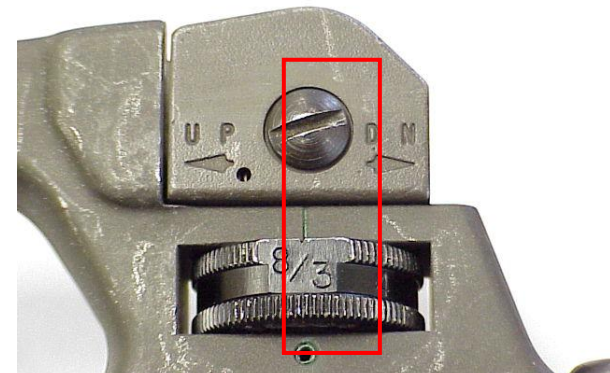
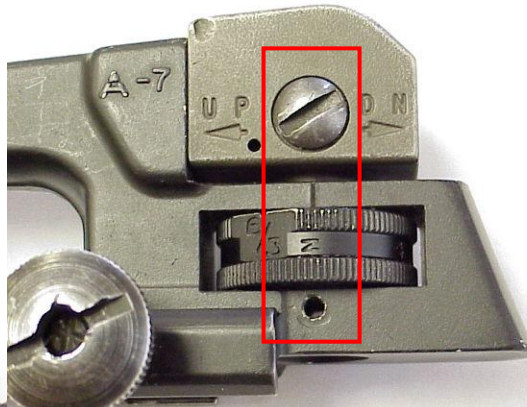
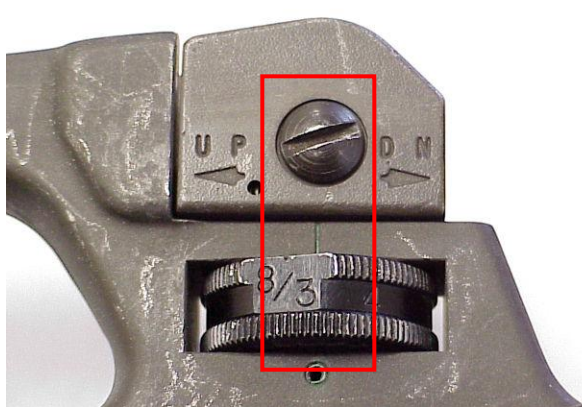


ZEROING AT 25 METERS

M16A2/A3
Up 1 click

M16A4
Up 2 clicks to Z setting

M4 Stays flush
on 300 setting

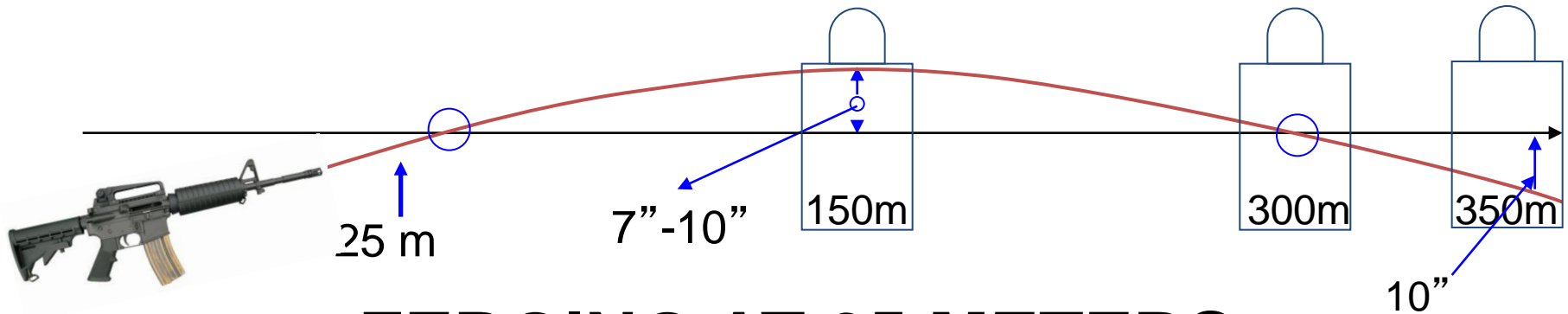




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Representation of M16 Bullet Path



ZEROING AT 25 METERS

Why are the settings different?



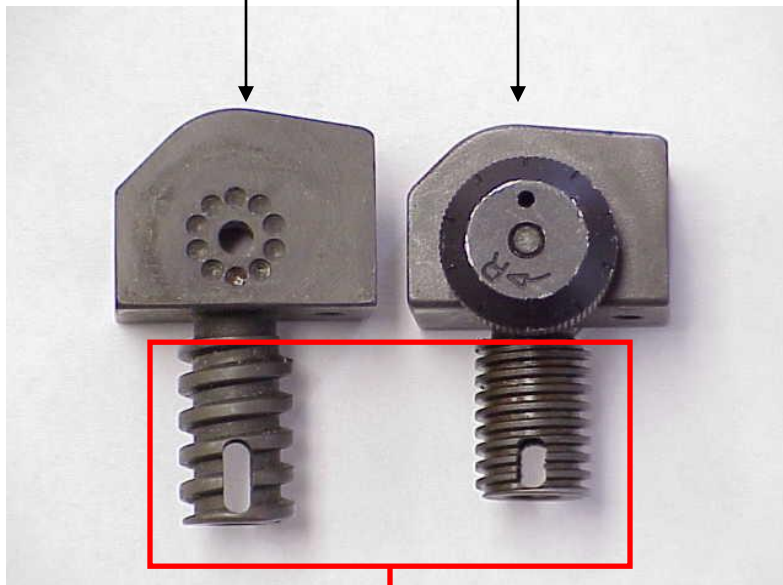
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M16 Rear Sights

M16A2/A3

M16A4



Difference in Thread Pitch

The difference can be seen in the thread pitch between a rear sight on a fixed carrying handle and that of a detachable. This is why you have to come up only one click on the M16A2/A3 and two clicks on the M16A4.

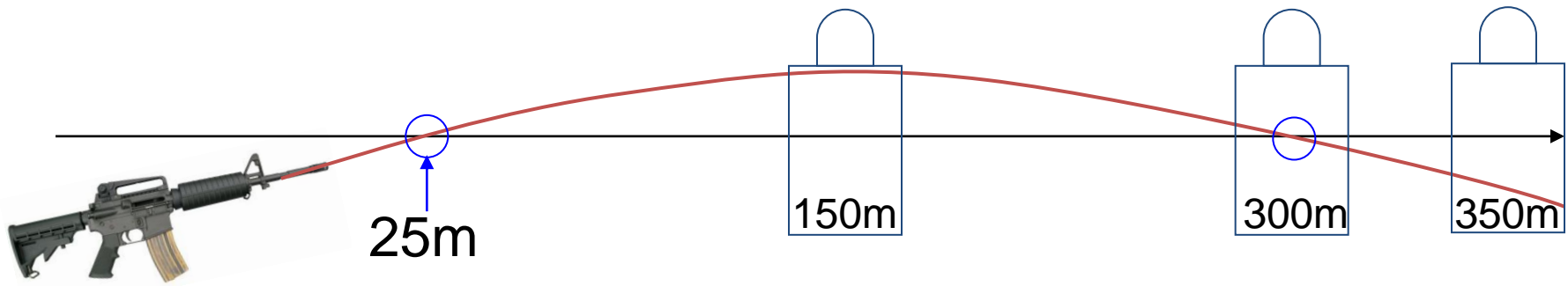
(Reference Army TM9-1005-319-10
Pg. 0011 00-7 #4)



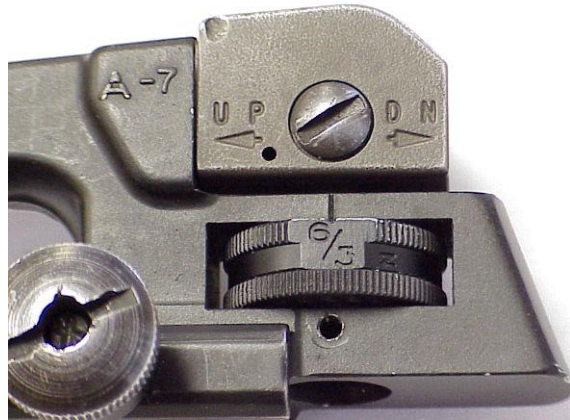
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Representation of M4 Bullet Path



M4 Zeroing: The M4 and M16A4 share the same carrying handle, however the M4's shorter barrel produces less muzzle velocity. The line of sight and path of the bullet cross at 25m AND at 300m.





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Front Sight Checks

- Blacken front sight using sight black spray or carbide lamp
- Dark non-reflective sights will make the rifle easier to aim and make the sight picture more crisp
- NEVER paint the front sight a bright color. Bright colors reflect light making it very hard to clearly see your front sight post
- Ensure the front sight rotates when the detent is depressed.





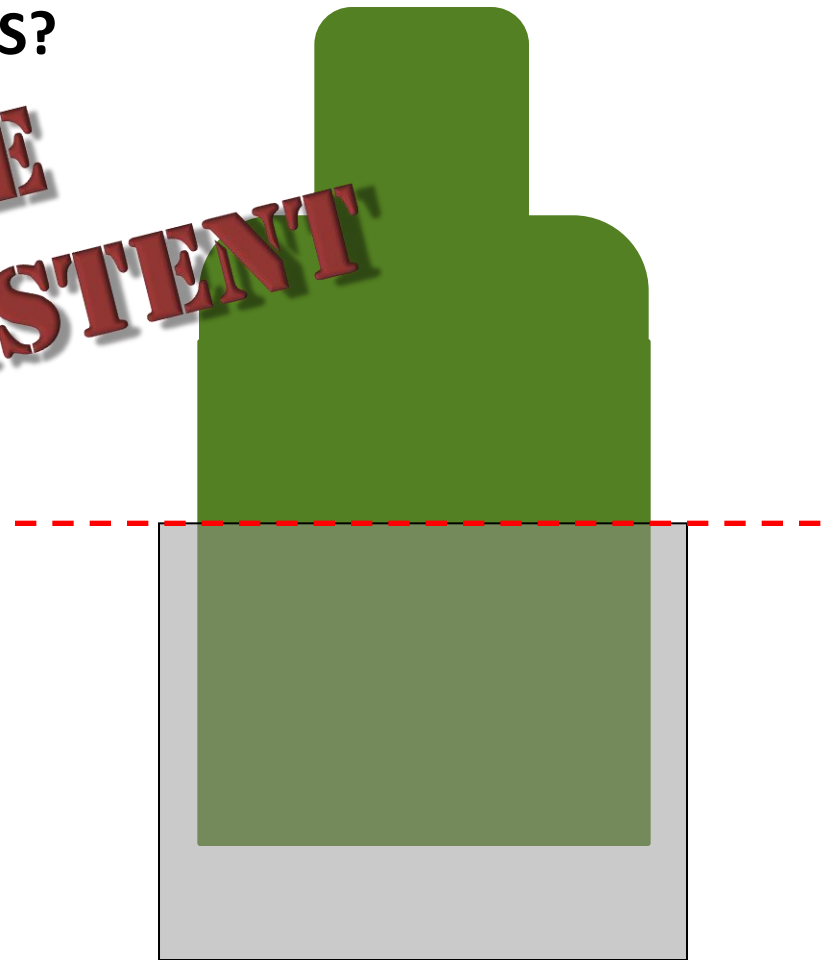
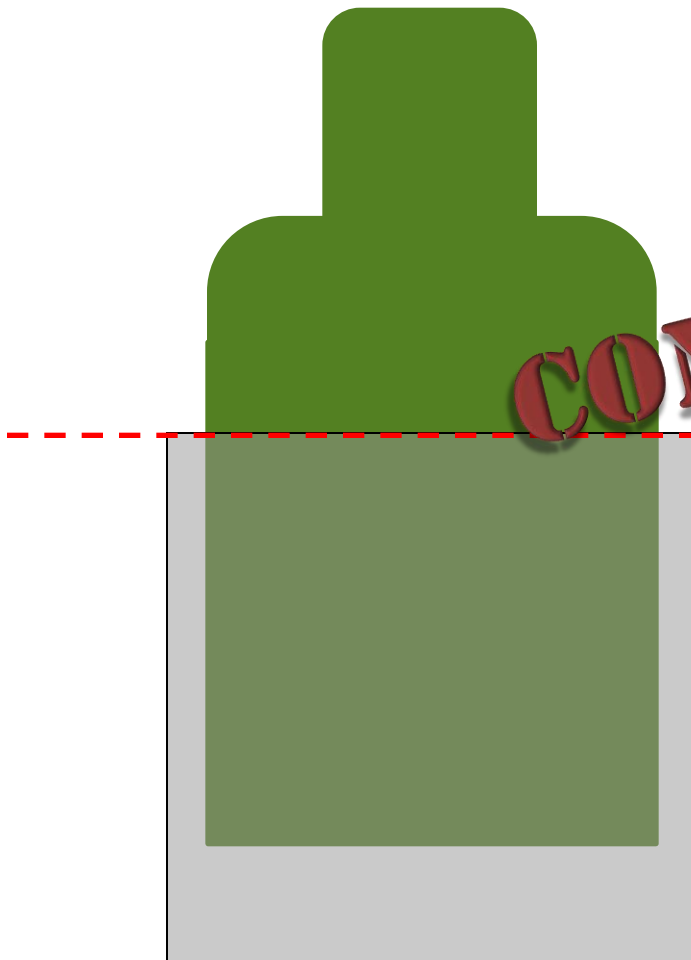
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Center Mass
Including head

Which is
**CENTER
MASS?**

Center Mass
NOT Including the head



**BE
CONSISTENT**

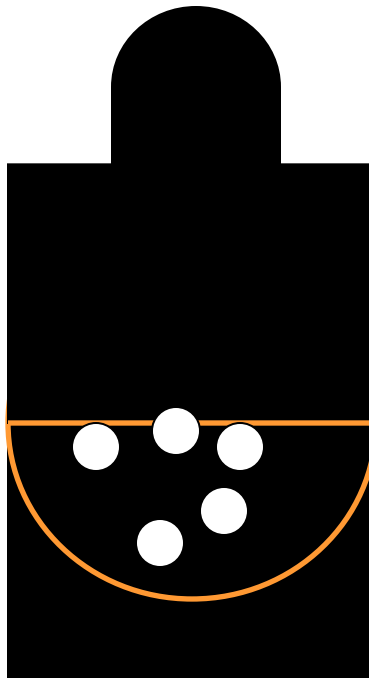


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Zeroing

Emphasize zeroing in the lower half of the 4 cm circle.
This will ensure a higher probability of hits from 150-250 meters.





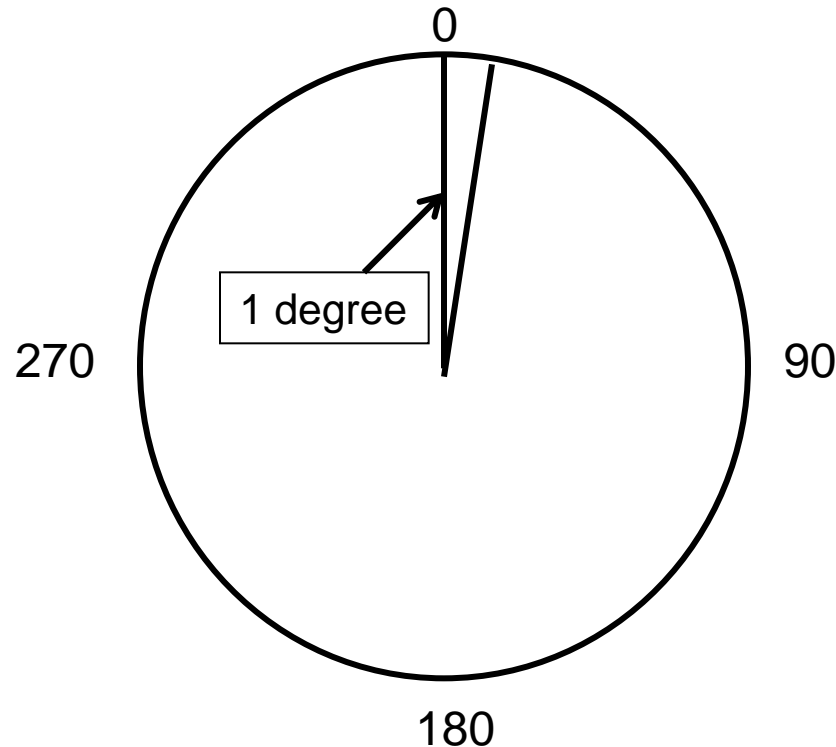
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What is Minute of Angle?

MOA is an angular unit of measure in fractions of degrees.

1 MINUTE OF ANGLE = $\frac{1}{60}$ of DEGREE





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Why is Minute of Angle important to you as a shooter?

It is the *unit of measure*, used by all weapon systems, with which you will make windage and elevation adjustments.

All adjustments will be converted from inches, at the target, to MOA for your corrections because sights and scopes move in Minutes of Angle.



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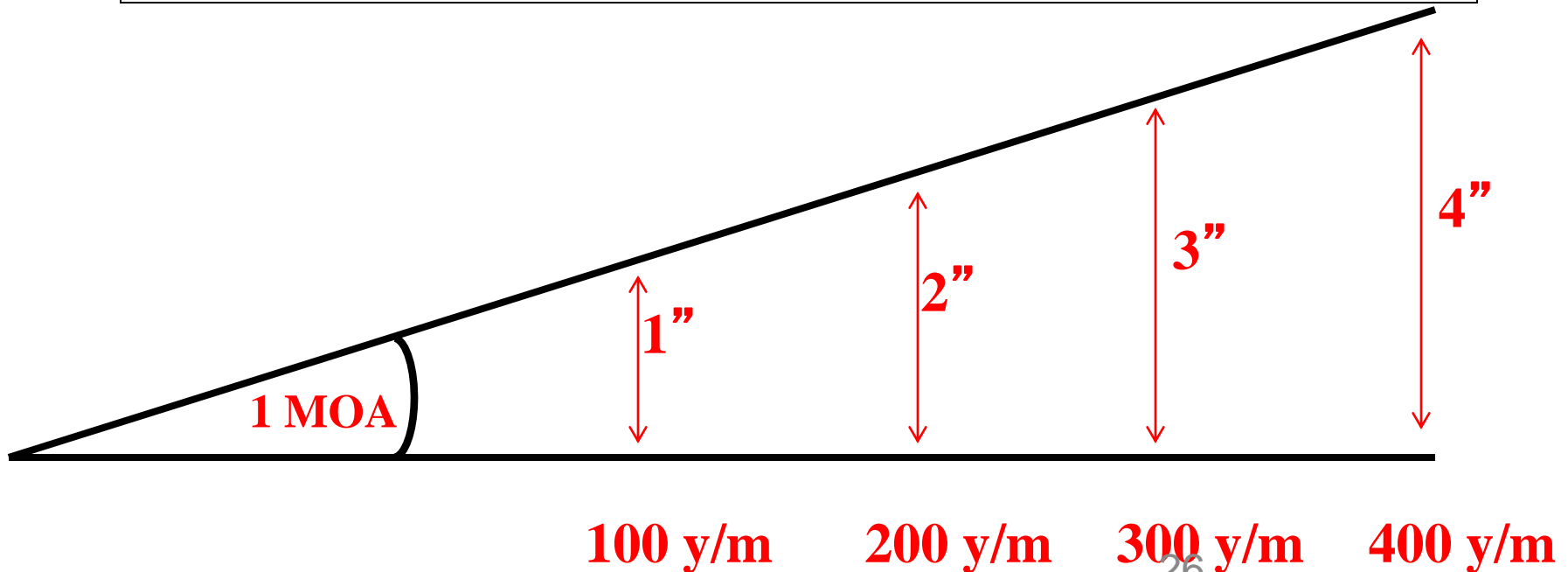


Minute of Angle (MOA)

1 minute of angle = 1 inch at 100 yards/meters

1 minute of angle = 2 inches at 200 yards/meters

1 minute of angle = 3 inches at 300 yards/meters





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Minute of Angle (MOA)

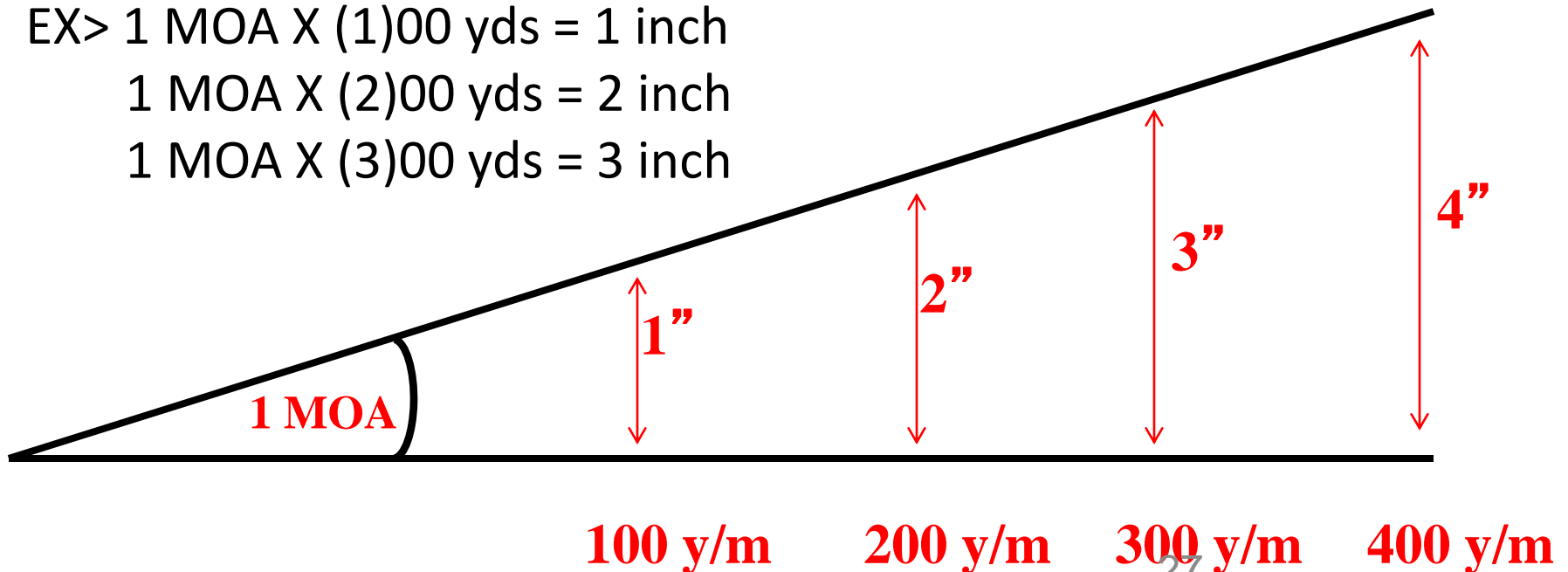
Now for the math.

MOA X yards (expressed in hundredths) = inches on target

EX> 1 MOA X (1)00 yds = 1 inch

1 MOA X (2)00 yds = 2 inch

1 MOA X (3)00 yds = 3 inch





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Minute of Angle Worksheet

1) 6" @ 600m= ?MOA	$6'' / (6)00m = 1 \text{ MOA}$
2) 3 MOA @ 200m= ?inch	$3 \times (2)00 = 6 \text{ inches}$
3) 6" @ 400m= ?MOA	$6'' / 4 = 1.5 \text{ MOA}$
4) 4 MOA @ 300m= ?inch	$4 \times (3)00 = 12 \text{ inches}$
5) 20" @ 500m= ?MOA	$20'' / 5 = 4 \text{ MOA}$
6) 5 MOA @ 300m= ?inch	$5 \times 3 = 15 \text{ inches}$



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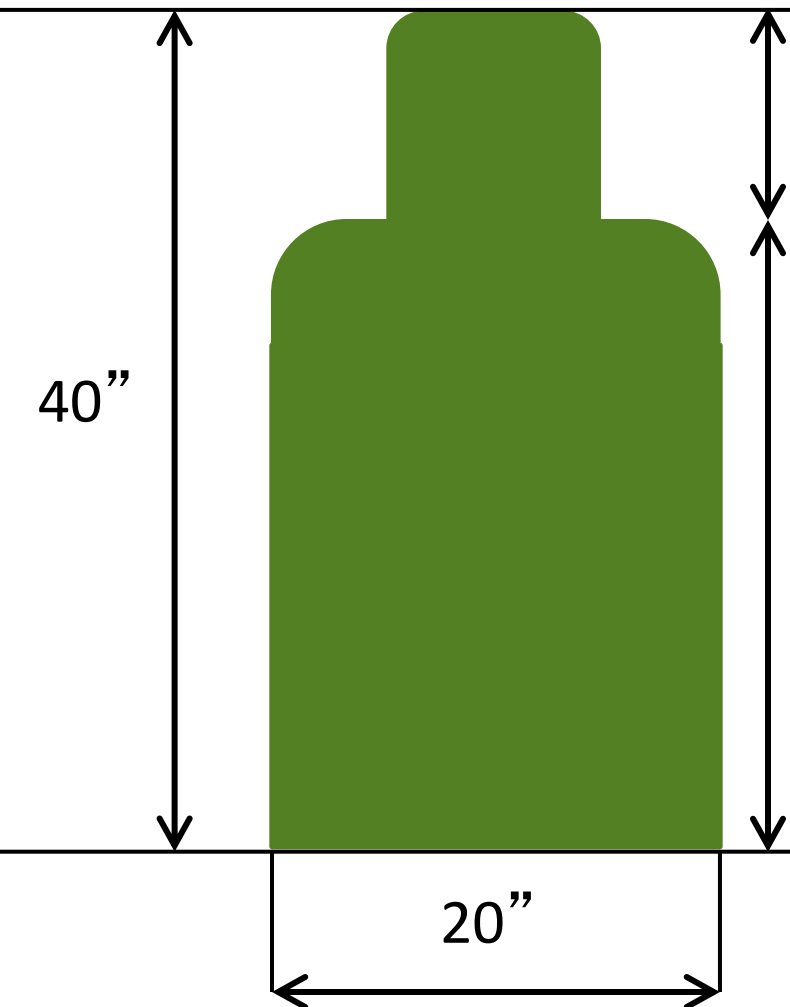


MOA Adjustments by Rifle

Sight / Rifle	M16A2	M16A4/A3	M4
Front Sight	App. 1 $\frac{1}{4}$ MOA	App 1 $\frac{1}{4}$ MOA	App 1 $\frac{3}{4}$ MOA
Windage Knob	$\frac{1}{2}$ MOA	$\frac{1}{2}$ MOA	$\frac{3}{4}$ MOA
Elevation wheel	1 MOA	$\frac{1}{2}$ MOA	$\frac{3}{4}$ MOA



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- The standard 'E-Type' Silhouette is 40" tall and 20" wide. This is to represent a human target in the kneeling position.
- Using known dimensions like these will make your Inch / MOA conversions much easier

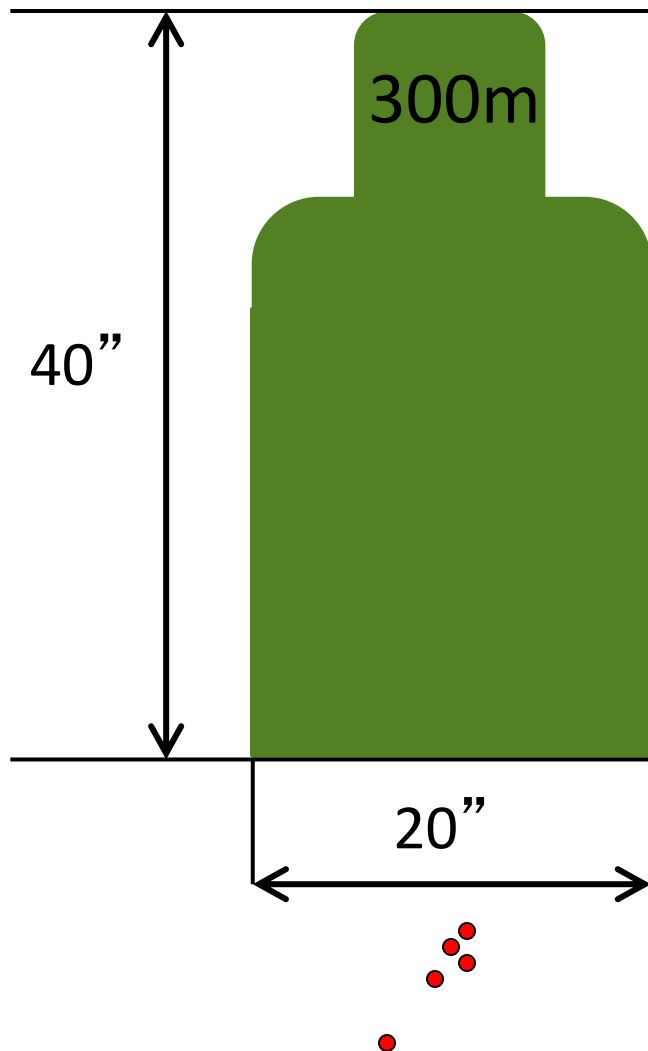
Putting it all together



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Minute of Angle Practical Exercise



1. Elevation adjustment?
 - a. Need to come up 30"
 - b. $30''/3(00)\text{m} = 10 \text{ MOA}$
 - c. 1 click on front sight = $1 \frac{3}{4} \text{ MOA}$
 - d. 10 MOA = about 6 clicks on front sight
2. Windage adjustment?
 - a. aligned

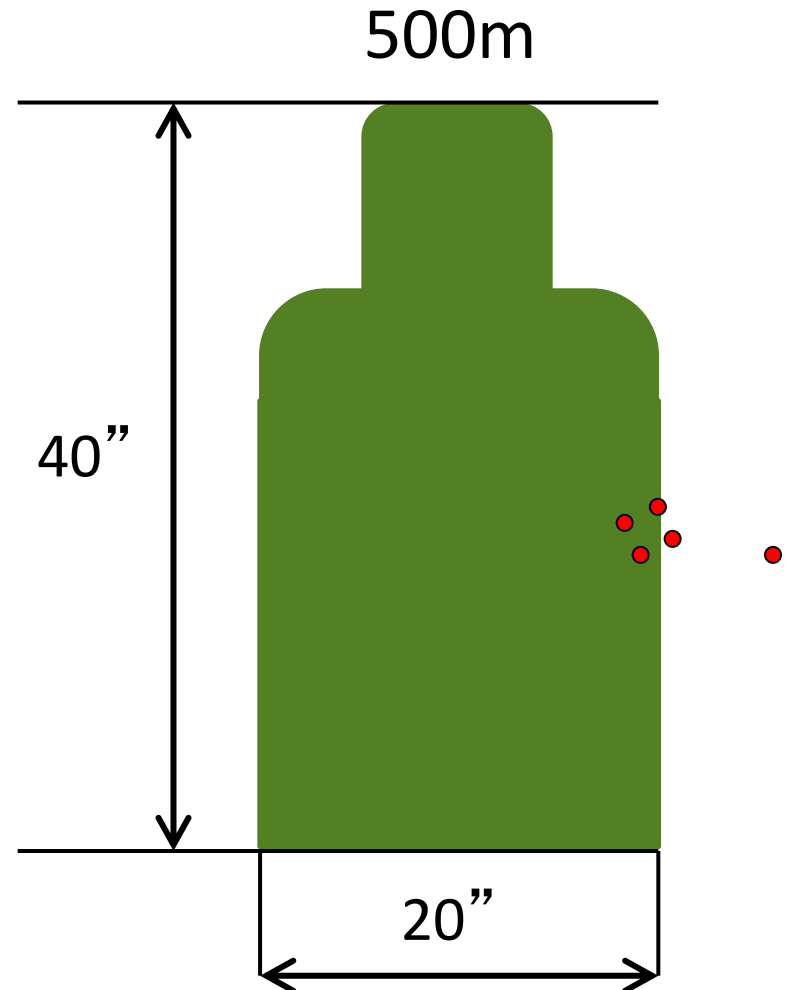


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Minute of Angle Practical Exercise

1. Elevation adjustment?
 - a. aligned
2. Windage adjustment?
 - a. Need to come left 10"
 - b. $10''/5(00)\text{m} = 2 \text{ MOA}$
 - c. 1 click of windage = $\frac{3}{4} \text{ MOA}$
 - d. 2 MOA = 3 clicks of windage



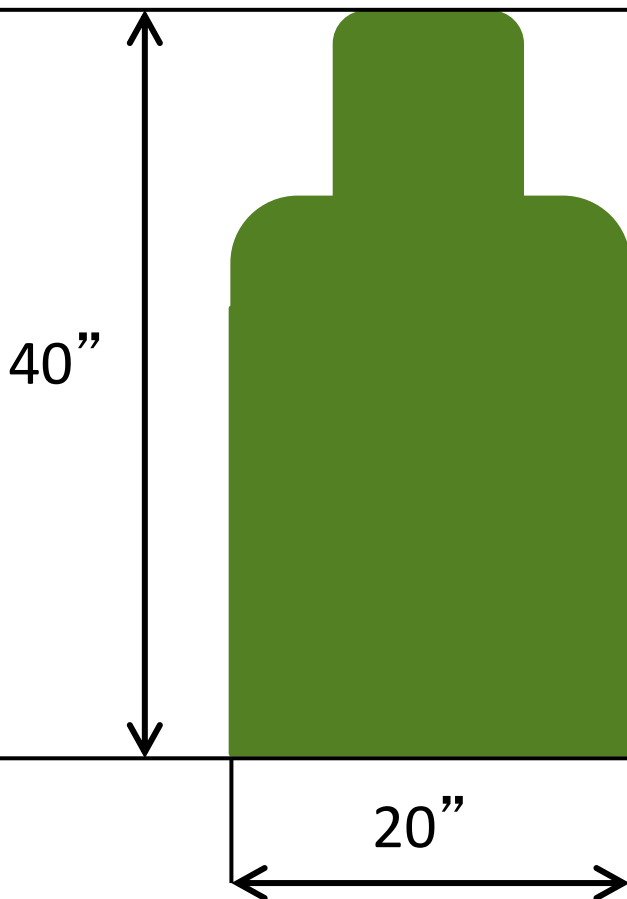


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Minute of Angle Practical Exercise

400m



1. Elevation adjustment?

a. Need to come down 24"

b. $24'' / 4(00)\text{m} = 6 \text{ MOA}$

c. 1 click on front sight = $1 \frac{3}{4} \text{ MOA}$

d. 6 MOA = approx 3 clicks on front sight

2. Windage adjustment?

a. Need to come left 20"

b. $20'' / 4(00)\text{m} = 5 \text{ MOA}$

c. 1 click of windage = $\frac{3}{4} \text{ MOA}$

d. 5 MOA = 7 clicks of windage



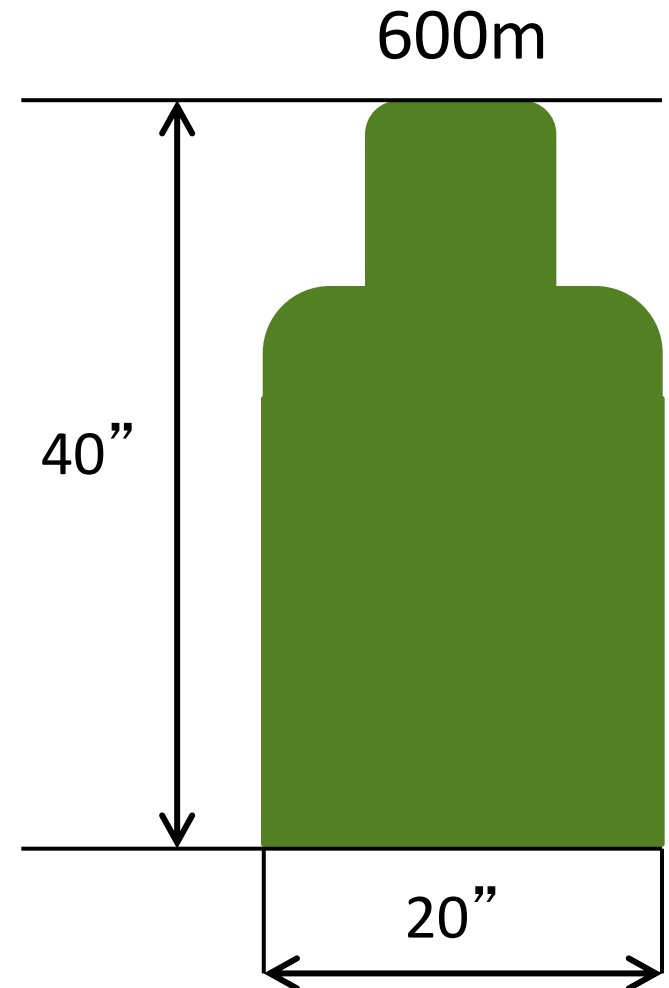
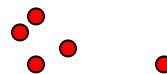
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Minute of Angle Practical Exercise

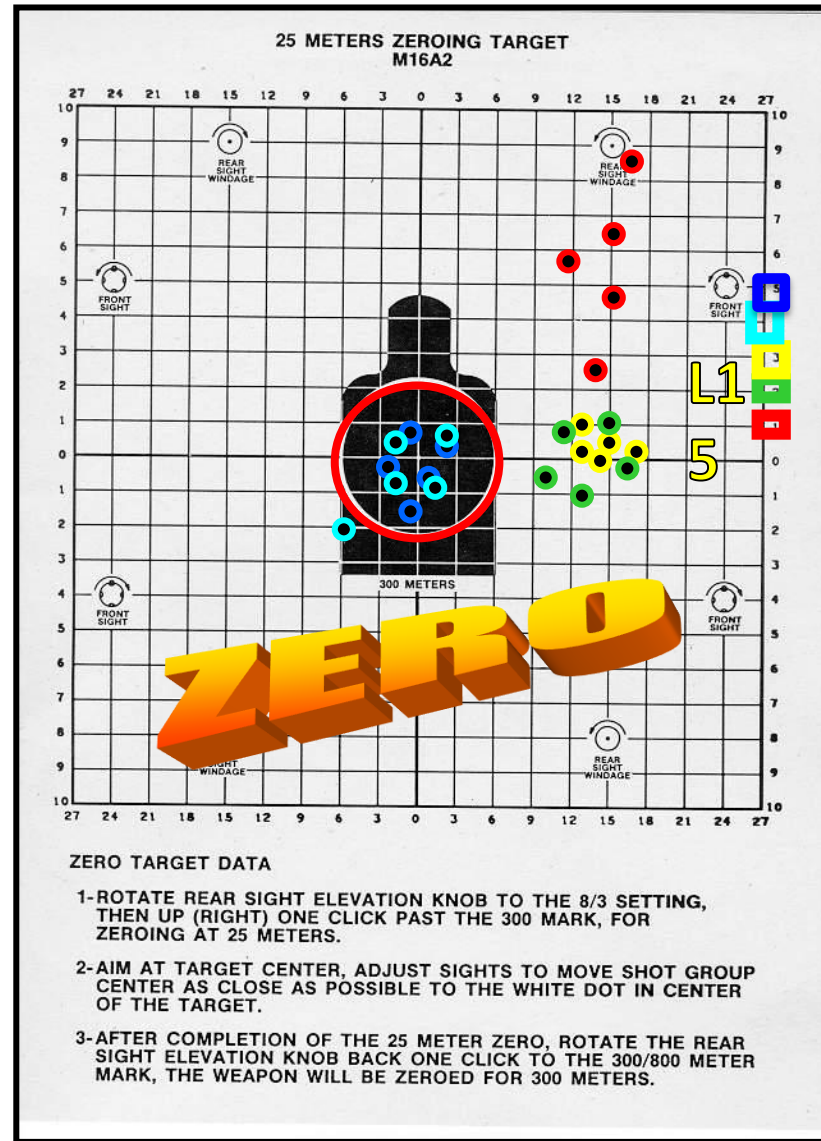
1. Elevation adjustment?
 - a. Need to come up 18"
 - b. $18''/6(00)\text{m} = 3 \text{ MOA}$
 - c. 1 click on front sight = $1 \frac{3}{4} \text{ MOA}$
 - d. 3 MOA = approx 2 clicks on front sight

2. Windage adjustment?
 - a. Need to come right 30"
 - b. $30''/6(00)\text{m} = 5 \text{ MOA}$
 - c. 1 click of windage = $\frac{3}{4} \text{ MOA}$
 - d. 5 MOA = 7 clicks of windage





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QUESTIONS?